WHAT IS CLAIMED IS:

1. A head positioning apparatus, comprising:

a magnetic head for recording / reproducing information on a rotary recording medium;

a head support mechanism provided swingably on the recording medium while supporting the magnetic head;

a coarse actuator for swinging the head support mechanism for coarsely positioning the magnetic head on the recording medium;

a fine actuator provided in the head support mechanism for precisely positioning the magnetic head on the recording medium;

a head position detector for detecting the head position representing the position of the magnetic head; and

a fine movement control system for controlling the fine actuator based on the head position detected by the head position detector,

the head positioning apparatus, further comprising:

a head moving distance estimator for estimating a head moving distance representing a distance the magnetic head moves based on VCM Back EMF voltage generated in the coarse actuator; and

a coarse movement control system for controlling the coarse actuator based on the head moving distance estimated by the head moving distance estimator.

2. The head positioning apparatus according to claim 1, wherein the coarse actuator comprises a voice coil motor.

3. The head positioning apparatus according to claim 1, wherein the head moving distance estimator comprises a head absolute speed estimator for estimating a head absolute speed representing the absolute speed of the magnetic head based on the VCM Back EMF voltage; and a coarse movement distance estimator for estimating the head moving distance based on the head absolute speed estimated by the head absolute speed estimator.

4. The head positioning apparatus according to claim 3, wherein the coarse movement moving distance estimator estimates the head moving distance based on the integration of the head absolute speed.

5. The head positioning apparatus according to claim 3, wherein the coarse movement moving distance estimator estimates the head moving distance based on the integration of the head absolute speed by setting the initial value of the head moving distance to zero.

6. The head positioning apparatus according to claim 3, wherein the fine movement control system comprises a fine movement controller for generating the control signal for controlling the fine actuator based on the head position detected by the head position detector; and further comprises a fine movement head moving distance estimator for estimating the fine movement head moving distance representing the amount that the magnetic head is moved by the fine actuator based on the control signal generated by the fine movement controller; and wherein

the coarse movement moving distance estimator estimates the head moving distance by defining the coarse movement head moving distance representing the amount that the magnetic head is moved by the coarse actuator, which is obtained by subtracting the fine movement head moving distance estimated by the fine movement head moving distance estimator from the head position detected by the head position detector, as a initial value.

7. The head positioning apparatus according to claim 6, wherein the coarse movement control system receives any of the coarse movement head moving distance obtained by subtracting the fine movement head moving distance from the head position, the head moving distance estimated by the coarse movement moving distance estimator, and the head position detected by the head position detector, in accordance with the magnitude of the fine movement head moving distance estimated by the head moving distance estimator and the error with respect to a targeted position of the head position detected by the head position detector.

8. The head positioning apparatus according to claim 3, wherein the fine movement control system comprises a fine movement controller for generating a fine control signal for controlling the fine actuator based on the head position detected by the head position detector; the coarse movement control system comprises a coarse movement controller for generating the coarse movement control signal for controlling the coarse actuator based on

the head moving distance estimated by the head moving distance detector; and the head position detector further comprises a fine movement head moving distance estimator for estimating a fine movement head moving distance representing the amount that the magnetic head is moved by the fine actuator based on the fine movement control signal generated by the fine movement controller and the coarse movement control signal generated by the coarse movement controller, and wherein

the coarse movement moving distance estimator estimates the head moving distance by defining the coarse movement head moving distance representing the amount that the magnetic head is moved by the coarse actuator, which is obtained by subtracting the fine movement head moving distance estimated by the fine movement head moving distance estimator from the head position detected by the head position detector, as a initial value.

9. The head positioning apparatus according to claim 8, wherein the coarse movement controller receives any of the coarse movement head moving distance obtained by subtracting the fine movement head moving distance from the head position and the head moving distance estimated by the coarse movement moving distance estimator, in accordance with the magnitude of the fine movement head moving distance estimated by the fine movement head moving distance estimator.

10. The head positioning apparatus according to claim 1, wherein the fine movement control system comprises a fine movement controller for generating the control signal for controlling the fine actuator based on the head position detected by the head position detector; and the fine movement driving device for generating a driving signal for driving the fine actuator based on the control signal generated by the fine movement controller.

11. The head positioning apparatus according to claim 1, wherein the fine actuator comprises a piezoelectric element;

the fine movement control system supplies a driving signal for driving the piezoelectric element to the piezoelectric element;

a level of the driving signal is not more than a threshold value at which the property of the piezoelectric element changes; and

the absolute value of the threshold value is larger than the absolute

value of the decomposition voltage of lead.

12. The head positioning apparatus according to claim 11, wherein the fine movement control system comprises a fine movement controller for generating the control signal for controlling the fine actuator based on the head position detected by the head position detector; the fine movement driving device for generating a driving signal based on the control signal generated by the fine movement controller; and a driving signal limiter for supplying a signal for limiting the level of the driving signal to be not more than the threshold value to the fine movement driving device based on the control signal from the fine movement controller.

13. The head positioning apparatus according to claim 11, wherein the absolute value of threshold value is larger than the absolute value of the decomposition voltage of water; and the voltage V (volt) of the driving signal and electric current I (ampere) flowing in the piezoelectric element satisfies the following relationship:

$$(I / V) < 10^{-6}.$$

14. The head positioning apparatus according to claim 11, wherein the absolute value of the threshold value is larger than the absolute value of the decomposition voltage of water; and the voltage V (volt) of the driving signal and the film thickness t (meter) of the piezoelectric element satisfies the following relationship:

$$(V / t) < 2 \times 10^{7}.$$

15. The head positioning apparatus according to claim 11, wherein the absolute value of the threshold value is larger than the absolute value of the decomposition voltage of water; and the driving signal has a voltage in which the electric resistance of the piezoelectric element is less than 1 MΩ.

16. The head positioning apparatus according to claim 11, wherein the threshold value is set under the conditions in which the electric resistance value of the piezoelectric element is 1 MΩ or more even if driving is carried out at the temperature of 85°C and the humidity of 90% for 500 hours continuously.

17. The head positioning apparatus according to claim 11, wherein in the case where the compensation amount of the piezoelectric element is zero, the fine movement control system outputs a constant value of offset voltage when the voltage applied to the piezoelectric element is zero or not more than a half of the threshold voltage; and in the case where the compensation amount of the piezoelectric element is not zero, the fine movement control system is control-driven by adding positive/negative voltage in accordance with the value of the compensation amount to the offset voltage.

18. The head positioning apparatus according to claim 1, wherein the head moving distance estimator comprises a head absolute speed estimator for estimating the head absolute speed representing the absolute speed of the magnetic head based on the VCM Back EMF voltage generated in the coarse actuator;

the coarse movement control system comprises a coarse movement controller for generating the coarse movement control signal for controlling the coarse actuator based on the head moving distance estimated by the moving distance estimator; and

the head positioning apparatus further comprises a load estimator for generating the disturbance compensation signal for estimating the disturbance acting on the head positioning apparatus based on the head absolute speed estimated by the head absolute speed estimator and the coarse movement control signal generated by the coarse movement controller.